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Department of Labor

Mine Safety and Health Administration

30 CFR Parts 58 and 72
Permissible Exposure Limit for Diesel Particulate; Proposed Rule

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Mine Safety and Health Administration

30 CFR Parts 58 and 72

RIN 1219–AA74

Permissible Exposure Limit for Diesel Particulate

AGENCY: Mine Safety and Health Administration, Labor.

ACTION: Advance notice of proposed rulemaking.

SUMMARY: The Mine Safety and Health Administration (MSHA) is in the early stages of developing a permissible exposure limit (PEL) for diesel particulate to control miners' exposure to diesel exhaust in the mining industry. This notice raises major issues which the Agency needs to consider with respect to possible regulatory action that would affect surface and underground mines in the coal, metal, and nonmetal mining sectors. The Agency seeks comment on the need for a standard, the specific regulatory language appropriate for a standard, the impact that various exposure limits would have on small businesses, and the need for recordkeeping and reporting requirements. In addition, comments are solicited on the need for a medical surveillance or screening program and on the use of respiratory equipment.

DATE: All written comments should be submitted by April 5, 1992.

ADDRESSES: Comments should be sent to Patricia W. Silvey, Director, Office of Standards, Regulations and Variances, MSHA, 4015 Wilson Boulevard, Arlington, Virginia 22203.

FOR FURTHER INFORMATION CONTACT: Patricia W. Silvey, Director, Office of Standards, Regulations and Variances, MSHA (703) 235–1910.

SUPPLEMENTARY INFORMATION:

I. Background

On October 6, 1987, MSHA published in the **Federal Register** (52 FR 37381) a notice of establishment of an advisory committee on standards and regulations for diesel-powered equipment in underground coal mines. On January 5, 1988, (53 FR 169) the Secretary of Labor appointed the advisory committee to make recommendations for standards and regulations related to the approval and safe use of diesel-powered equipment in underground coal mines. The committee provided a collective expertise not otherwise available to the Secretary to address complex issues associated with mining and diesel powered equipment. The Committee submitted its recommendations in July 1988, based on its 6-month review of safety, health, and technical issues. These recommendations incorporated a three-tiered approach to reduce potential safety and health hazards.

The first approach recommended that all diesel equipment except for limited class be approved for use in underground coal mines. This approval would involve both safety (e.g., fire suppression systems) and health factors (e.g., maximum exhaust emissions).

The second approach recommended standards to address the safety aspects of the use of diesel equipment. These safety aspects included such concerns as equipment maintenance, training of mechanics, and the storage and transport of diesel fuel.

The third approach recommended standards to address the health aspects surrounding the use of such equipment. The committee emphasized the importance of the health implications of diesel exhaust relating to both the gaseous and particulate components and recommended that regulations be promulgated for monitoring and controlling the particulate. (The problem of noxious gases will be addressed in the air quality rulemaking, RIN 1219–AA48.) The committee did not recommend a specific level of exposure to diesel particulate based on the existing data and current available technology for monitoring the amount of diesel particulate in mining.

After considering the information available in 1988, the advisory committee was concerned that diesel exhaust represents a probable risk for causing human lung cancer. The committee's report recommended that MSHA regulate the use of diesels in underground coal mines to protect the health of miners by two means. First, MSHA should implement a system to control the amount of diesel particulate where diesel equipment is used underground. Second, the Secretary should set in motion a mechanism whereby a diesel particulate standard can be set.

The committee made several research proposals to the Secretary because they recognized the difficulty in implementing their recommendations based on the body of scientific knowledge that existed at the time of the report. The committee recommended that the Secretary request that the National Institute for Occupational Safety and Health (NIOSH) and the Bureau of Mines (BOM) give the highest priority to research in the development of sampling methods and devices for diesel particulate. In addition, the committee concluded that in the absence of adequate information regarding diesel particulate exposure levels at which health effects accrue, more research is needed.

After the transmission of the committee's report to the Secretary, MSHA formally requested NIOSH to perform a risk assessment for exposure to diesel particulate and requested BOM and NIOSH to develop sampling and analytical methodologies for assessing exposure to diesel particulate in mining operations. Initiatives were also undertaken to have BOM place a high priority on conducting research toward the control of diesel particulate and to have MSHA test and evaluate the technology available to measure and control diesel particulate in the mining environment, as well as characterize occupational exposures to diesel particulate.

As a result of these initiatives by the Secretary, MSHA has received additional documentation from NIOSH and BOM. This documentation includes:

1. "An Exploratory Risk Assessment of the Risk of Lung Cancer Associated with Exposure to Diesel Exhaust Based on a Study in Rats." R. Smith and L. Stayner, Division of Standards Development and Technology Transfer, NIOSH, July 2, 1990. This study employed the Armitage-Doll multi-stage model to represent the relationship between exposure to diesel exhaust and the risk of lung tumors in rodents. The results of the modeling were used to produce quantitative estimates of the risk of lung cancer in humans.

2. "Pollutant Levels in Underground Coal Mines Using Diesel Equipment." B. Cantrell, K. Rubow, W. Watts, and D. Carlson, BOM, presented at the Society of Mining Engineers, February 25, 1991. This report includes field testing data on the personal diesel exhaust aerosol sampler and an impact assessment on the effects of diesel face haulage equipment on air quality in mines.

3. "Control of Diesel Exhaust Emissions." R. Waytulonis, BOM, Proceedings of the Twenty-first Annual Institute on Coal Mining Health, Safety, and Research, 1990. This paper includes a review of conventional work practices and devices used to control diesel exhaust emission, as well as a discussion of new control techniques being tested by the Bureau of Mines.

4. "Measurement of Coal Dust and Diesel Exhaust Aerosols." K. Rubow, *et al.*, Proceedings of the VIIth International Pneumoconiosis Conference, NIOSH, 1988. This study was conducted to determine the effectiveness of size selective sampling

as a measuring technique for diesel aerosols used in underground coal mines.

5. "Development of a Personal Diesel Aerosol Sampler—Design and Performance Criteria." B. Cantrell and K. Rubow, Preprint No. 90–74, SME Annual Meeting, Salt Lake City, Utah, 1990. This paper covers the design and performance criteria used in developing a personal diesel aerosol sampler.

In addition, MSHA has participated in the development and publication of the following documents pertaining to the measurement of diesel particulate in underground mines and the determination of underground occupational exposures to diesel particulate:

1. "Development and Evaluation of a Diesel Particulate Sampler." T. Tomb, R. Haney, A. Gero, and P. Parobeck, Symposium on Respirable Dust in the Mineral Industries, October 17, 1990. Included in this paper are the results of an MSHA evaluation concerning diesel particulate samplers developed by the University of Minnesota and MSHA. The evaluation was conducted under laboratory conditions as well as in four underground coal mines where diesel-powered equipment is used.

2. "Evaluation of Personal Diesel Particulate Samplers." R. Haney, Proceedings of the 4th U.S. Mine Ventilation Symposium Berkeley, California, 1989. The report describes the evaluation of a prototype impact on sampling devices used to measure submicron particulate levels in underground coal mines.

3. "Diesel Particulate Exposures in Underground Mines." R. Haney, Preprint No. 90–40, Society for Mining, Metallurgy, and Exploration, Inc., SME Annual Meeting, Salt Lake City, Utah, 1990. This paper summarizes exposure to diesel particulate from comparative samples taken from various occupations in both coal and metal/nonmetal mining. In addition, the paper describes and evaluates the accuracy and precision of the instrumentation and analytical methods used.

Other information pertaining to the health risks associated with exposure to diesel particulate is contained in the following publications:

1. "Diesel Particulate Study." (Draft). Emission Control Technology Division, Office of Mobile Sources, Office of Air and Radiation, U.S. Environmental Protection Agency, October 1983. The purpose of this study was to provide a comprehensive assessment of the costs and benefits associated with the control of diesel particulate emissions and to recommend a regulatory strategy for such control.

2. "Air toxic Emissions and Health Risks from Mobile Sources." J. Adler and P. Carey, Air and Waste Management Association Annual Meeting, June 25, 1989. This paper focuses on all air carcinogens emitted from motor vehicles for which EPA has unit risk estimates.

To ensure that all relevant information is considered in the development of a proposed rule, the Agency is seeking further information on the risk associated with exposure to diesel particulate, the methodology available for assessing occupational exposures to diesel particulate, and the technology available or under development to reduce the concentration of diesel particulate in the mining environment. Upon completion of a comprehensive analysis of the comments and any other information received in response to this advance notice of proposed rulemaking (ANPRM), MSHA plans to publish a proposed rule to address the need to adequately assure, on the basis of the best available evidence, that no miner will suffer material impairment of health or functional capacity even if such miner has regular exposure to the hazards of diesel particulate for the period of his working life. In addition to the attainment of the highest degree of health protection to the miner, other considerations in this proposed rule will be the latest available scientific data, technological and economic feasibility issues, and the Agency's experience under its health regulations.

II. Public Participation

Interested parties are encouraged to submit comments on any of the specific issues identified for public comment and on any other issues dealing with the protection of miners from the hazards of diesel particulate.

As part of this review and in addition to the statutory requirements of the Federal Mine Safety and Health Act of 1977, MSHA will also be evaluating its proposed standards in accordance with Executive Order 12291, the Regulatory Flexibility Act, and the Paperwork Reduction Act.

III. Specific Issues Identified for Comment

As a diesel particulate standard would affect the entire mining industry, commenters should provide specific justification, based upon particular mining methods, practices, and conditions, for their positions. Comment is requested on the health effects, technological and economic feasibility, and provisions which should be considered for inclusion in a diesel particulate rule. Mine operators and other interested parties should identify and discuss both the quantifiable and nonquantifiable potential benefits and costs of compliance with various levels of diesel particulate, the methods of monitoring to measure exposure, the duration and frequency of exposure, etc. Economic information should include capital, maintenance, and ongoing costs. While MSHA requests comments on all relevant diesel particulate issues, the Agency is particularly interested in comments on the following specific issues.

1. Exposure Limit

What information is available concerning the relationship between working lifetime diesel particulate exposure and a risk of lung cancer or other biological response?

What level of risk should be used to determine a permissible exposure limit for diesel particulate?

What methology (absolute or relative risk) should be used to arrive at the risk relationship? How do factors such as smoking and exposure to other carcinogens affect this relationship?

How should the results of a quantitative risk assessment be used in arriving at an exposure limit?

Should all mines under MSHA jurisdiction be subject to the same exposure limit?

Should a short term exposure limit (STEL) as well as a time weighted average (TWA) permissible exposure limit (PEL) be established?

Should MSHA set an action level for occupational exposure to diesel exhaust? What types of provisions should be established in such a standard? To what extent would these provisions be met by current practices in the mining and other industries, and what would be their costs?

What effect does the environmental background level of diesel particulate have on diesel particulate exposure to miners?

Are there individual components of whole diesel exhaust that would better indicate the carcinogenic hazard than diesel particulate? If so, identify these components.

2. Risk Assessment

In its quantitative risk assessment, NIOSH relied on the Mauderly et al. rodent study to estimate the lung cancer risk to humans exposed to diesel exhaust. NIOSH determined that this study provided the best available data for diesel exhaust risk assessment because it had a long period of follow up, several well-chararacterized

exposure concentrations, and a large number of animals per exposure group.

Using the Armitage-Doll multistage model, NIOSH found statistically significant dose-response relationships which were determined suitable for estimating human risks at expected human doses. However, several comments and studies submitted to the Department of Labor in other rulemakings (e.g., methylene chloride and 1,3-butadiene) have raised the issue that the dose-response risk assessment approach used by the Department and other Federal agencies to estimate the carcinogenic risk to humans may be inappropriate. It is argued that this method does not take into account the metabolic differences between rodents and humans when exposed to certain toxic chemicals. These comments and studies suggest that risk extrapolated from test animals based on applied dose methods may overestimate the cancer risk.

The information acquired through this ANPRM will aid MSHA in resolving the uncertainties and in determining if species differences should be incorporated into NIOSH's model for estimating cancer risks to humans exposed to diesel exhaust.

Epidemiological Studies

To what extent do existing epidemiological studies provide a reliable estimate of the risk of lung cancer from exposure to diesel particulate? How reliable and valid are the outcome data in each study?

What limitations should be applied to interpreting the available epidemiological studies? Should any of the studies be excluded from consideration, either partially or entirely, due to inadequacies in design or in the way they were conducted?

Have the studies used an appropriate comparison population?

Does the possible presence of other carcinogens such as asbestos, arsenic, nickel, or chromium affect the reliability of the study?

Are there inconsistencies among results of epidemiological studies, and if there are, can they be explained?

Animal Studies

Are there animal studies, other than those used in the NIOSH Exploratory Risk Assessment, that should be considered to establish risk?

What parameters should be used to convert animal data to human data (i.e., body weight or surface area, age scaling methods, etc.)?

Appropriateness of Models to Assess Risk

MSHA recognizes the large areas of uncertainty which exist in applied dose risk assessment procedures. Can other forms of modeling (e.g., pharmacokinetics) reduce these uncertainties, and if so, can the reduction in uncertainty be quantified? Are additional uncertainties introduced into the risk assessment process by the use of other models? What weight should MSHA give to other modeling data in its risk assessments and why?

What consideration should be given to selecting a model when using animal data to evaluate the risk associated with exposure to diesel particulate in humans?

Would a linear nonthreshold model extrapolated from elevated exposure levels from animal studies be the most appropriate model to predict average lifetime lung cancer risks from exposure to diesel particulate in humans?

What is the best estimate of a latency period? How should latency be incorporated into the risk assessment model?

Should the risk relationship be modified in some fashion to account for cell repair or other factors?

Does the latency period vary with smoking? Does the latency period vary with total exposure or exposure rate?

Should a maximum likelihood estimate (MLE) or 95 percent upper confidence limit (UCL) estimate of risk be used?

3. Consideration of Other Information

Are there other health effects (noncarcinogenic) that result from exposure to diesel particulate?

What effect does smoking have on the risk of lung cancer in miners exposed to diesel particulate? If there is an effect, is it additive, multiplicative, or is there some other relationship? Is there information to indicate that diesel particulate works in conjunction with other contaminants?

What dermal absorption studies for diesel exhaust are available? What are the potential adverse health effects from dermal exposure alone or from a combined exposure by inhalation and dermal routes?

4. Sampling and Monitoring Methods

What methods are available to measure diesel particulate exposures in underground mines?

Are existing sampling and exposure monitoring methods sufficiently sensitive, accurate and reliable? If not, what methods would be more suitable?

What criteria should be the basis for a sampling strategy?

Would personal or area sampling be more appropriate?

MSHA solicits information on the conditions under which personal or area sampling devices should or should not be used for measuring diesel exhaust exposures.

Are there any surrogate methods available that can be used to monitor diesel particulate levels? What are the advantages, disadvantages, and relative costs for these methods?

5. Feasibility

A critical issue in the development of a diesel particulate standard is the technological feasibility of various techniques for controlling diesel particulate emissions. MSHA recognizes the wide variation in types of mines, equipment, operations, and conditions. As a result, MSHA requests both general and specific information, as well as any other relevant factors regarding the following questions. Commenters should compare alternative approaches in terms of cost and relative effectiveness.

To what extent can the design of a mine, the mining system, and the mine ventilation system be used to control exposure to diesel particulate?

If mine ventilation is used to reduce diesel particulate concentration, what would be the additional costs to reduce the concentration in increments of 100 micrograms per cubic meter of air? Would the potential costs of controlling diesel particulate affect the extent to which diesel equipment is used?

What reduction in the concentration of diesel particulate can be achieved through the use of low sulfur fuels? Does the reduction of a fuel's sulfur content reduce the hazard associated with diesel particulate? Is there a difference in the amount of particulate produced from the use of No. 1 or No. 2 diesel fuel? What is the sulfur content of fuels currently being used at diesel mines? What would be the reduction in diesel particulate if the sulfur content were reduced to 0.05 percent? When will 0.05 percent sulfur fuel be generally available to the mining industry?

What are the differences in the per-gallon costs among No. 1, No. 2, and 0.05 percent sulfur diesel fuel? How much fuel is used annually in the mining industry? What would be the economic impact on mining of using 0.05 percent sulfur fuel?

Are fuel additives available or being developed that can reduce diesel particulate emissions? What diesel particulate emission reductions can be

expected through the use of these fuel additives? Will the use of these fuel additives introduce other health hazards? If so, what specific health hazards would be introduced with the use of these fuel additives? What would be the cost of these additives? Are there any additional advantages to the use of additives, such as increased fuel efficiency?

Are there any anticipated changes in engine design that will affect diesel particulate emissions? What are these expected changes and to what extent will they reduce diesel particulate emissions? When will engines incorporating these designs be available to the mining industry?

What would be the expected increase in price of new diesel equipment or the components incorporating these anticipated changes? Would there be additional operational costs resulting from these changes?

What type of after-treatment devices are available or being developed to reduce particulate emissions from equipment with water bath scrubbers, light duty equipment such as personnel carriers and service vehicles, heavy duty equipment such as load-haul-dump vehicles and haul trucks, and stationary equipment? Will the use of these after-treatment devices introduce other health hazards? What specific health hazards would be introduced with the use of these after-treatment devices?

What diesel particulate reduction can be expected through the use of after-treatment devices? What additional maintenance requirements will be necessary as a result of adding these devices? What problems would be encountered in retrofitting existing equipment with after-treatment devices? What would be the initial cost of the devices, including installation? How long would these devices last before they needed to be replaced? What would be the costs of maintaining these devices? Would there be any loss of production specifically due to the use of these devices?

Manufacturers of engines used in over-the-road vehicles have developed and are developing after-treatment devices for the removal of diesel particulate. What after-treatment devices currently being developed for over-the-road vehicles would be applicable to the mining industry? What diesel particulate reduction can be achieved through the use of these after-treatment devices?

Is specialized training required for diesel mechanics working on equipment that uses particulate reduction technology? If specialized training is required, what type of specialized training should be required, and how extensive and costly would such training be?

What maintenance procedures are effective in reducing diesel particulate emissions from existing diesel-powered equipment? What additional maintenance procedures would be required in conjunction with anticipated developments of new diesel particulate reduction technology? How much time would be required to perform maintenance procedures? What, if any, production loss would occur during the performance of these procedures?

What is the lowest feasible exposure level of diesel exhaust that can be achieved by engineering controls and work practices alone? Are there unique conditions in certain mining settings where feasible engineering controls are not available?

Dated: December 30, 1991.

William J. Tattersall,

Assistant Secretary for Mine Safety and Health.

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